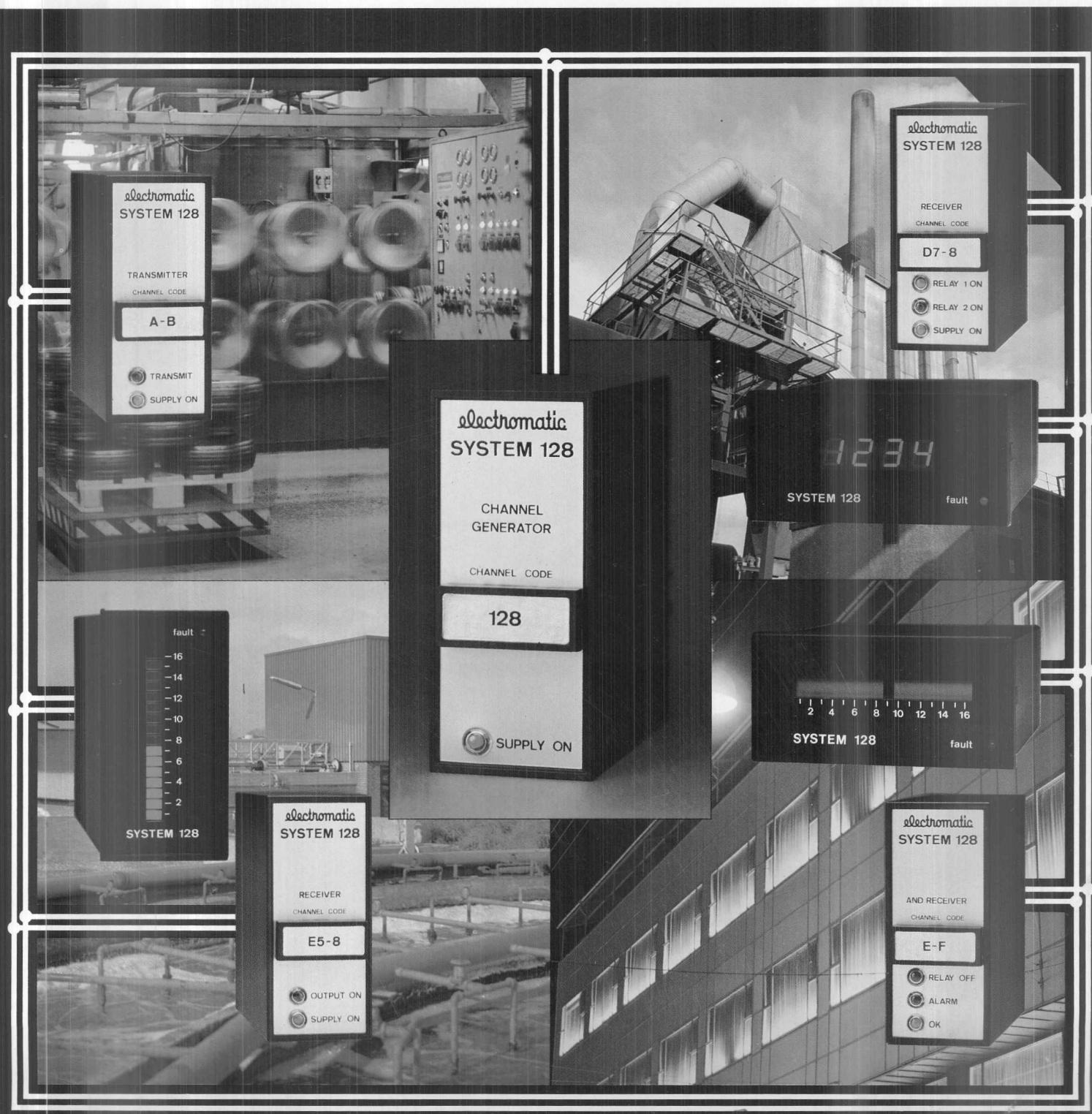


F-SYSTEM

TWO-WIRE TRANSMISSION SYSTEM
FOR MONITORING AND CONTROL



Electromatic, manufacturer of electronic components and control systems for use in industry, agriculture, etc. since 1956, considers simple module construction, compatibility, easy installation and reliability to be of vital importance. The F-system has been developed and produced in compliance with these requirements.

The development of the F-system is based on the following idea: To create an extremely flexible and long-range **monitoring- and control system** based on a single standard 2-wire cable for two-way transmission of digital pulse codes.

The F-system is **long-range** in that the total length of the 2-wire transmission cable can be up to several kilometers. The **flexibility** of the F-system shows in many ways:

The **transmission cable** is selected by the user from among ordinary 2-wire standard cables with the most advantageous ratio of cross section to capacitance.

The transmission cable can be placed in a circle, a star, a straight line or combinations thereof.

The **modules**, i.e. transmitters, receivers as well as channel generator, are all built into one and the same elegant, black housing type with 11-pole spade plug and front plate of anodized aluminium, module dimensions: 35 × 80 mm.

Receivers with display are built into black housings according to DIN-norm 43700, front plate dimensions: 48 × 96 mm or 48 × 144 mm.



Any F-module can be connected to the transmission cable wherever it might be required. Thus, it is possible to **extend** the F-system at any time anywhere on the transmission line.

The **code module**, which is plugged into every F-module, connects transmitters and receivers as required and can at any time be exchanged by one of the remaining 254 channel combinations. This makes it possible to alter the interconnection between the modules of an F-system without changing the installation or the position of F-modules.

From the above it becomes evident that at low initial costs an F-system can be acquired for monitoring/controlling a given process/procedure – and at very low costs an already existing F-system can be extended or changed. Electromatic's experience and famed customer-oriented product development ensure that the needs of the user of an F-system for control and monitoring will be met for many years to come.

A code module is not to be removed from an F-system during operation, as an activated transmitter emits signals on all channels when the code module is removed.

Consequently, in alarm systems a module like f.inst. FBD 911 should be applied for monitoring the channels not in use. This ensures that a code module cannot be removed from an alarm system without the alarm being activated.

Finally, a brief description of the F-modules mentioned in the table stating types:

Channel generator

To a fully functioning F-system belongs one and only one channel generator separately supplied and by means of the code module coded to work on 8, 16, 32, 64 or 128 channels as required. The channel generator is the heart of an F-system as it emits the digital pulse code constantly being »pumped« out into the 2-wire transmission cable. Simultaneously, F-module transmitters (type FGD) without separate power supply can be supplied.

Transmitters

Not less than one and up to more than 128 transmitters can be connected to the same two wires. One type of transmitters (FGD) is supplied via the 2-wire transmission cable, while another type (FFD) requires separate DC- or AC-supply and has LED-display for activation and supply.

Transmitters can be for contact input, NPN with open collector or voltage input.

Receivers

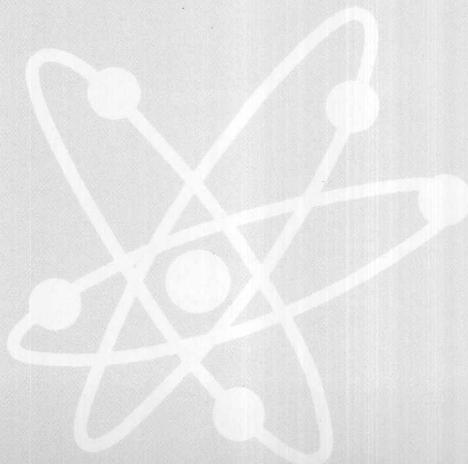
Not less than one and up to an unlimited number of receivers can be connected to the same two wires. All receivers are separately supplied and delivered with relay- or transistor output as well as LED-display with 1, 2 or 3 diodes. Furthermore, all the receivers (except for FAD 203 xxx) can supply a transmitter type FFD. Functionwise, F-module receivers are available as monostable or bistable, with or without memory and, if required, with logic function and as special alarm receivers.

Displays

Are separately supplied, available in LED- or LCD version, in bargraph version (dots or line) and as channel indicators with vertical or horizontal scale or in horizontal version with 7-segment digits. Contrary to the remaining F-modules the code module is plugged into the back of the housing of the display module.

Use

The F-system is advantageous within many fields, for instance for monitoring and control within industry as well as remote control of purifying processes and pumping stations, as control- and alarm system in office blocks and public buildings and for central remote monitoring and control of not very accessible production processes.

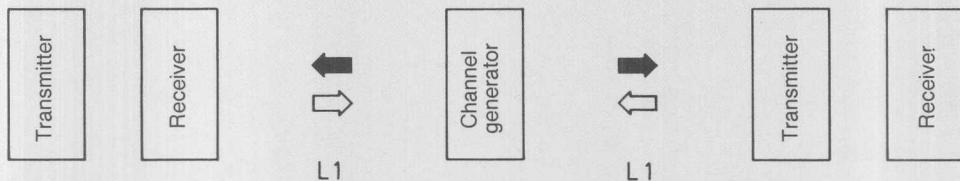


TRANSMISSION RANGE



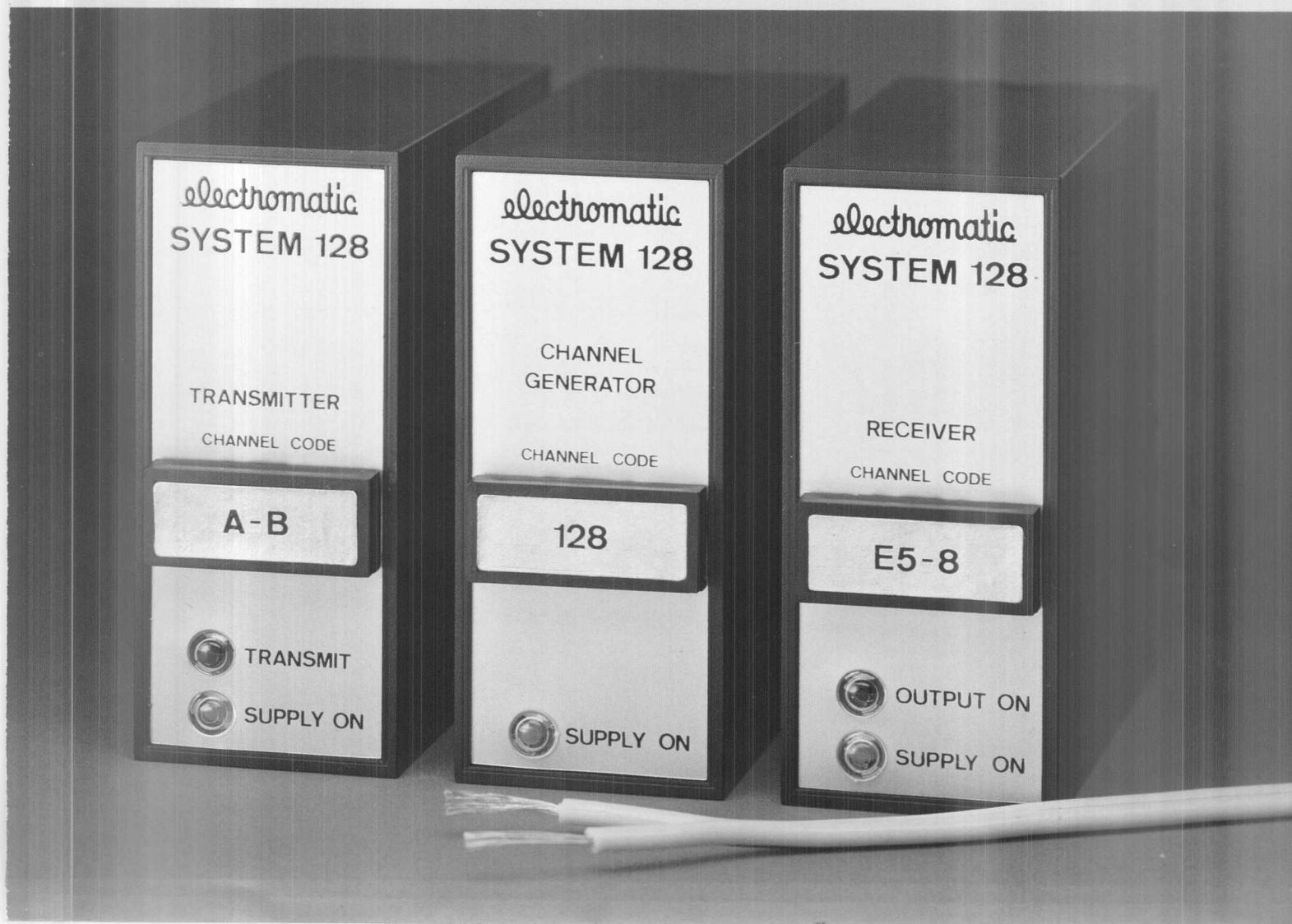
Mounting principle of the F-system in its simplest design consisting of a transmitter module, a channel generator and a receiver module.
A pulse emitted by the transmitter is passed on to the receiver by the generator.

The maximum transmission range is obtained by placing the channel generator between the transmitter and the receiver. Often though, the channel generator and the transmitter module are placed at the same position whereby the transmission range will correspond to L2 (above).



In a two-way transmission system the longest possible distance between the channel generator and the receiver module is obtained by placing the channel generator at the middle of the transmission cable. By means of a transmission cable of, for instance, 0.5 mm² with 100 nF/km, distances of up to 5 km for L1 and up to 6 km for L2 can be obtained.

Where several transmitters are applied the only way of obtaining the maximum distance is to use transmitters with separate power supply.



The F-SYSTEM

TRANSMITTERS

* supplied through 2-wire transmission line

Mechanical input (Inverted)

Function	Input	Channels	Input Open/Closed	Indication	Type No.	Diagram
Monostable	1 parallel	1	8 V/8 µA	No	FGD 100	A
Flip-flop	1 parallel	1	8 V/8 µA	No	FGD 110	A
Bistable	2 parallel	1	8 V/8 µA	No	FGD 120	
Monostable	2 parallel	2	8 V/8 µA	No	FGD 200	C
Monostable	4 parallel	4	8 V/8 µA	No	FGD 400	C
Monostable w/ latching	4 parallel	4	8 V/8 µA	No	FGD 430	B
Monostable	8 parallel	8	8 V/8 µA	No	FGD 500	C
Monostable	4 × 4 matrix	16	8 V/8 µA	No	FGD 600	

* separately supplied: 10 – 30 VDC

Voltage input: 6–32 VDC (Non-inverted)

Function	Input	Channels	Impedance	Indication	Type No.	Diagram
Monostable	1 parallel	1	27 kΩ	2 LED	FFD 101 700	F
Flip-flop	1 parallel	1	27 kΩ	2 LED	FFD 111 700	F
Bistable	2 parallel	1	27 kΩ	2 LED	FFD 121 700	F
Monostable	2 parallel	2	27 kΩ	2 LED	FFD 201 700	F
Monostable	4 parallel	4	27 kΩ	2 LED	FFD 401 700	F
Monostable w/ latching	4 parallel	4	27 kΩ	2 LED	FFD 431 700	
Monostable	8 parallel	8	27 kΩ	2 LED	FFD 501 700	F

RECEIVERS

* with relay output (SPDT)

Monostable

Function	Memory	Channels	Min. activation time	Indication	Type No.	Diagram
Monostable	No	1	500 ms	2 LED	FAD 101 xxx	D
Monostable	No	2	500 ms	3 LED	FAD 203 xxx	*
OR-NOR	No	Multi	500 ms	2 LED	FAD 911 xxx	D
AND-NAND	No	Multi	500 ms	2 LED	FAD 921 xxx	D

xxx = Supply voltage: 024 (24 VAC), 120 (120 VAC), 220 (220 VAC).

* With dual SPDT output relay.

Bistable

Function	Memory	Channels	Min. activation time	Indication	Type No.	Diagram
Flip-flop	No	1	500 ms	2 LED	FBD 101 xxx	E
Flip-flop	Yes	1	500 ms	2 LED	FCD 101 xxx	E
ON-OFF	No	2	500 ms	2 LED	FBD 201 xxx	E
ON-OFF	Yes	2	500 ms	2 LED	FCD 201 xxx	E
OR-NOR	No	Multi	500 ms	3 LED	FBD 911 xxx	E
AND-NAND	No	Multi	500 ms	3 LED	FBD 921 xxx	E

xxx = Supply voltage: 024 (24 VAC), 120 (120 VAC), 220 (220 VAC).

* separately supplied

Mechanical/NPN open collector input (Inverted)

Function	Input	Channels	Input Open/Closed	Indication	Type No.*	Diagram
Monostable	1 parallel	1	8 V/300 µA	2 LED	FFD 100 700	A
Monostable	1 parallel	1	8 V/300 µA	2 LED	FFD 100 xxx	A
Flip-flop	1 parallel	1	8 V/300 µA	2 LED	FFD 110 700	A
Bistable	2 parallel	1	8 V/300 µA	2 LED	FFD 120 700	
Monostable	2 parallel	2	8 V/300 µA	2 LED	FFD 200 700	C
Monostable	2 parallel	2	8 V/300 µA	2 LED	FFD 200 xxx	C
Monostable	4 parallel	4	8 V/300 µA	2 LED	FFD 400 700	C
Monostable	4 parallel	4	8 V/300 µA	2 LED	FFD 400 xxx	C
Monostable w/ latching	4 parallel	4	8 V/300 µA	2 LED	FFD 430 700	B
Monostable	8 parallel	8	8 V/300 µA	2 LED	FFD 500 700	C
Monostable	4 × 4 matrix	16	8 V/300 µA	2 LED	FFD 600 700	

* ...700: 10 – 30 VDC supply.

...xxx: 024 (24 VAC), 120 (120 VAC), 220 (220 VAC).

* with solid state output

(NPN w/open collector: 60 V – 0.5 A without diode protection)

Monostable

Function	Memory	Channels	Min. activation time	Indication	Type No.*	Diagram
Monostable	No	1	500 ms	2 LED	FAD 104 700	F
Monostable	No	2	500 ms	3 LED	FAD 204 700	F
Monostable	No	4	200 ms	1 LED	FAD 404 700	F
Monostable	No	8	200 ms	1 LED	FAD 504 700	F
Monostable	No	Multi	500 ms	2 LED	FAD 914 700	
Monostable	No	Multi	500 ms	2 LED	FAD 924 700	

* FAD xxx 700 for 10–30 VDC supply.

Bistable

Function	Memory	Channels	Min. activation time	Indication	Type No.*	Diagram
Flip-flop	No	1	500 ms	2 LED	FBD 104 700	F
ON-OFF	No	2	500 ms	2 LED	FBD 204 700	F
OR-NOR	No	Multi	500 ms	3 LED	FBD 914 700	
AND-NAND	No	Multi	500 ms	3 LED	FBD 924 700	

* FBD xxx 700 for 10–30 VDC supply.

DISPLAYS

* with light-emitting diodes (LED)

(faults indicated by red LED and activation of NPN open collector (35 V – 100 mA), pin 5)

Bargraph

Function	Display	Channels	Min. activation time	Type No.*	Diagram
ON-OFF	2 dots	1	200 ms	FKC 1002 xxx	H
Binary	4 dots/in line**	2	200 ms	FKC 2204 xxx	H
Binary	8 dots/in line**	4	200 ms	FKC 4208 xxx	H
Binary	16 dots/in line**	4	200 ms	FKC 4216 xxx	H
Channel indicator	2 dots	2	200 ms	FKC 2302 xxx	H
Channel indicator	4 dots	4	200 ms	FKC 4304 xxx	H
Channel indicator	8 dots	8	200 ms	FKC 5308 xxx	H
Channel indicator	16 dots	16	200 ms	FKC 6316 xxx	H
Channel indicator	32 dots	32	200 ms	FKC 8332 xxx	H

xxx = Supply voltage: 024 (24 VAC), 120 (120 VAC), 220 (220 VAC).

* Add an H or a V after the type no. for horizontal or vertical mounting respectively.

** »Dots« or »in line« is selected by built-in switch. When these types are used, do not apply a code module for 8 channels (FMK 8) to the channel generator.

7-Segment digits

Function	Display	Channels	Min. activation time	Type No.	Diagram
Binary	1½ digits	4	200 ms	FKC 4715 xxx	H
BCD*	2 digits	8	200 ms	FKC 5720 xxx	H
BCD*	4 digits	16	200 ms	FKC 6740 xxx	H
BCD*	6 digits	24**	200 ms	FKC 7760 xxx	H

xxx = Supply voltage: 024 (24 VAC), 120 (120 VAC), 220 (220 VAC).

* BCD = Binary-coded decimal notation.

** FKC 7760 xxx takes up the last 24 out of 32 channels in the applied plug-in code module.

* with liquid crystal display (LCD)

Bargraph

Function	Display	Channels	Min. activation time	Type No.*	Diagram
Binary	4 dots/in line**	2	200 ms	FLC 2204 xxx	H
Binary	8 dots/in line**	4	200 ms	FLC 4208 xxx	H
Binary	16 dots/in line**	4	200 ms	FLC 4216 xxx	H
Channel indicator	2 dots	2	200 ms	FLC 2302 xxx	H
Channel indicator	4 dots	4	200 ms	FLC 4304 xxx	H
Channel indicator	8 dots	8	200 ms	FLC 5308 xxx	H
Channel indicator	16 dots	16	200 ms	FLC 6316 xxx	H
Channel indicator	32 dots	32	200 ms	FLC 8332 xxx	H

xxx = Supply voltage: 024 (24 VAC), 120 (120 VAC), 220 (220 VAC).

* Add an H or a V after the type no. for horizontal or vertical mounting respectively.

** »Dots« or »in line« is selected by built-in switch. When these types are used, do not apply a code module for 8 channels (FMK 8) to the channel generator.

7-Segment digits

Function	Display	Channels	Min. activation time	Type No.	Diagram
Binary	1½ digits	4	200 ms	FLC 4715 xxx	H
BCD*	2 digits	8	200 ms	FLC 5720 xxx	H
BCD*	4 digits	16	200 ms	FLC 6740 xxx	H
BCD*	6 digits	24**	200 ms	FLC 7760 xxx	H

xxx = Supply voltage: 024 (24 VAC), 120 (120 VAC), 220 (220 VAC).

* BCD = Binary-coded decimal notation.

** FLC 7760 xxx takes up the last 24 out of 32 channels in the applied plug-in code module.

MISCELLANEOUS

Channel generator type FPD 100 xxx

xxx = Supply voltage: 024 (24 VAC), 120 (120 VAC), 220 (220 VAC).

Digital channel generator for 8, 16, 32, 64 or 128 channels. One and only one FPD 100 xxx is required for one complete F-system. See diagram G.

Power supply type FPD 600 xxx

xxx = Supply voltage: 024 (24 VAC), 120 (120 VAC), 220 (220 VAC).

Delivers 12 VDC for up to 16 transmitters type FFD. The power supply unit requires no plug-in code module.

Plug-in code module type FMK

A code module is plugged into each F-module to function as a key to/from the F-module in question.

A total of 260 different plug-in code modules is available, 5 of which are reserved for channel generator, type FPD 100 xxx. The remaining 255 plug-in code modules are available upon quoting the following type nos.

1-channel code modules (128 types)

FMK A1	FMK B1	FMK P1
FMK A2	FMK B2	FMK P2
: : or	: :	or...
FMK A8	FMK B8	FMK P8

2-channel code modules (64 types)

FMK A1-2	FMK B1-2	FMK P1-2
FMK A3-4 or	FMK B3-4	or...
FMK A5-6	FMK B5-6	FMK P5-6
FMK A7-8	FMK B7-8	FMK P7-8

4-channel code modules (32 types)

FMK A1-4 or	FMK B1-4	or...	FMK P1-4
FMK A5-8	FMK B5-8		FMK P5-8

8-channel code modules (16 types)

FMK A
FMK B
FMK C
FMK D
FMK E
FMK F
FMK G
FMK H
FMK I
FMK J
FMK K
FMK L
FMK M
FMK N
FMK O
FMK P

16-channel code modules (8 types)

FMK A-B
FMK C-D
FMK E-F
FMK G-H
FMK I-J
FMK K-L
FMK M-N
FMK O-P

32-channel code modules (4 types)

FMK A-D
FMK E-H
FMK I-L
FMK M-P

64-channel code modules (2 types)

FMK A-H
FMK I-P

128-channel code module (1 type)

FMK A-P

Code modules for channel generator type FPD 100 xxx have the following type nos.:

FMK 8 (for an F-system with a total of 8 channels, i.e. the first 8 channels (A)).

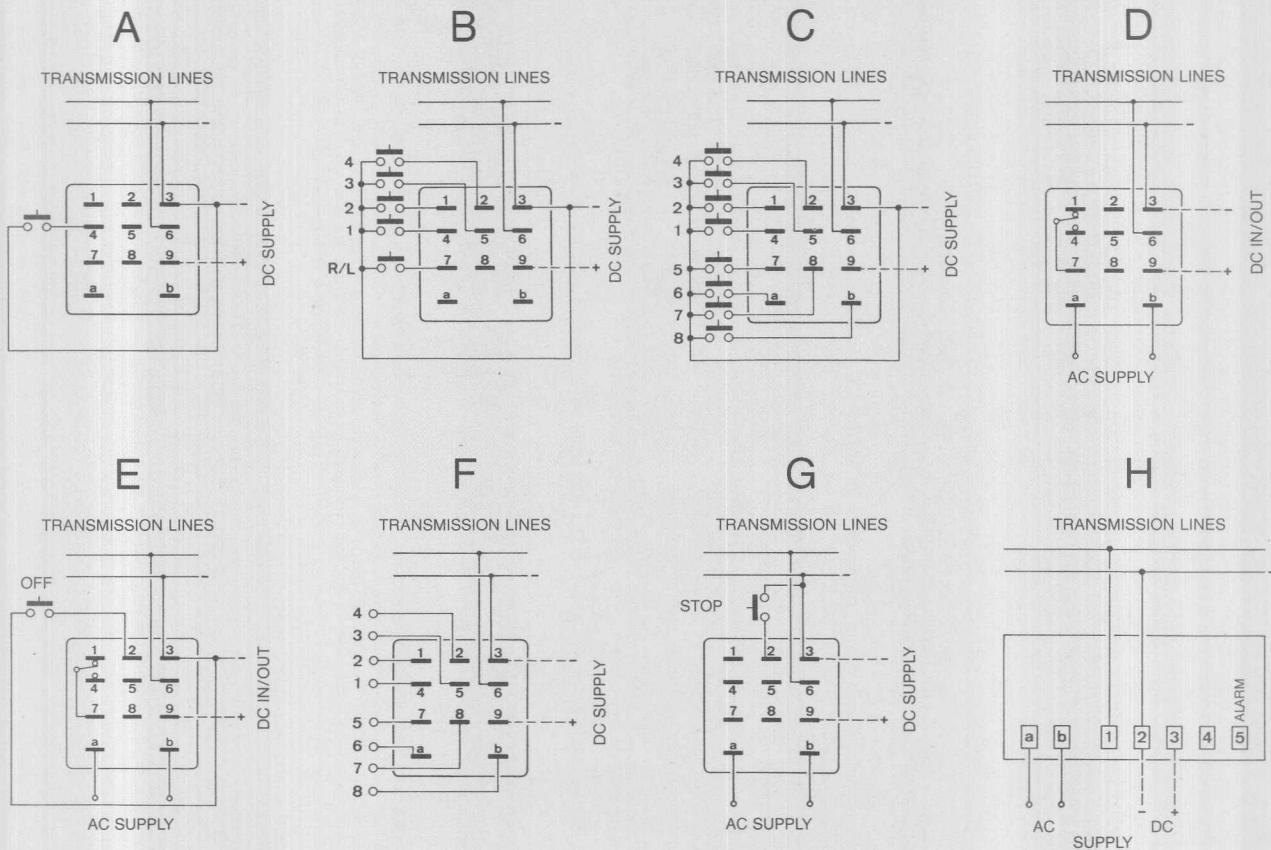
FMK 16 (for an F-system with a total of 16 channels, i.e. the first 16 channels (A-B)).

FMK 32 (for an F-system with a total of 32 channels, i.e. the first 32 channels (A-D)).

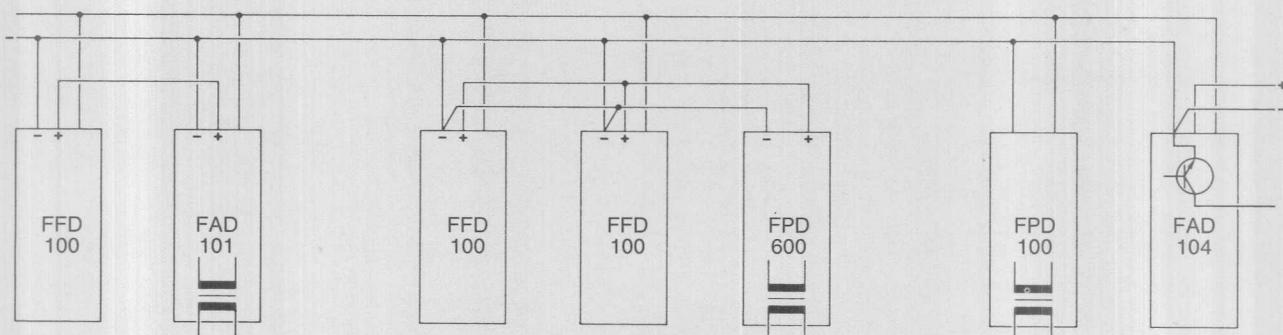
FMK 64 (for an F-system with a total of 64 channels, i.e. the first 64 channels (A-H)).

FMK 128 (for an F-system with a total of 128 channels, i.e. all 128 channels (A-P)).

WIRING DIAGRAMS



IMPORTANT GUIDELINES ON INSTALLATION



The two-wire transmission cable must always be balanced.

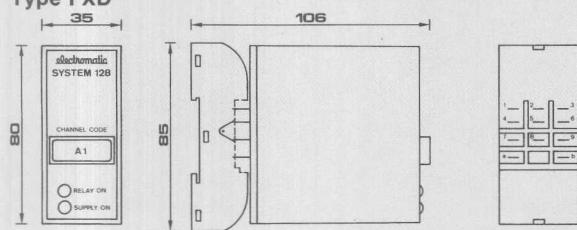
- The two wires must always be installed in the same cable – or in the immediate vicinity of each other (also inside a control housing).
- Each group of transmitters (receivers) must be separately supplied (type FPD 600).

c) Solid state outputs of receivers must be separately supplied (to avoid great inductive loads).

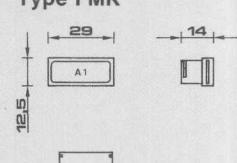
- Transmitters must always be placed near connected contacts, sensors etc.
- In environments presenting electrical problems it may be necessary to shield the transmission cable.

EXTERNAL DIMENSIONS (mm)

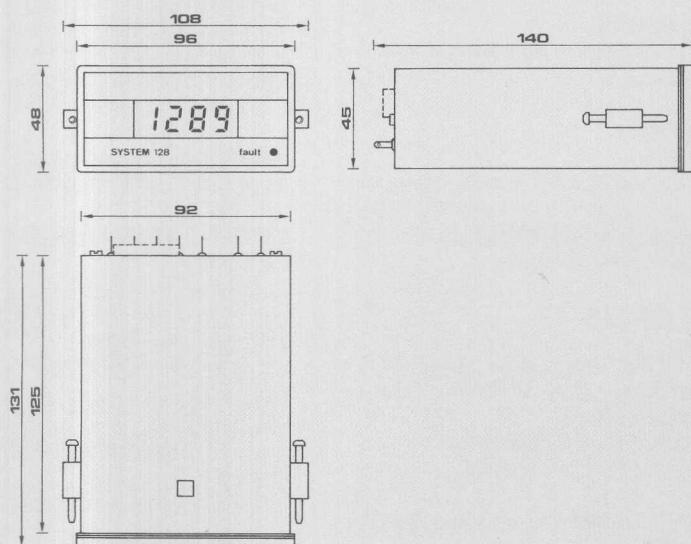
Type FXD



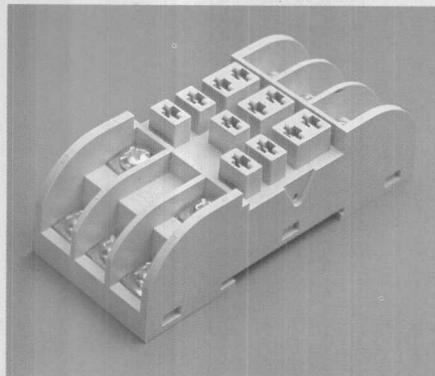
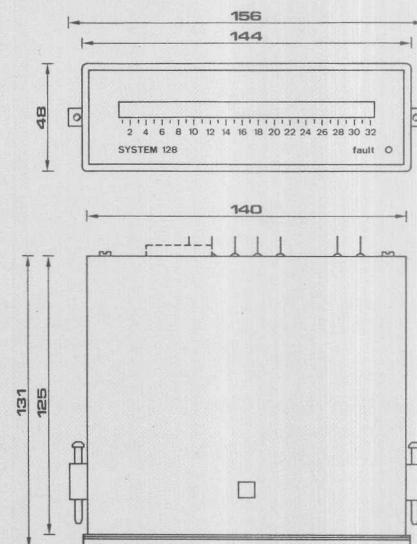
Type FMK



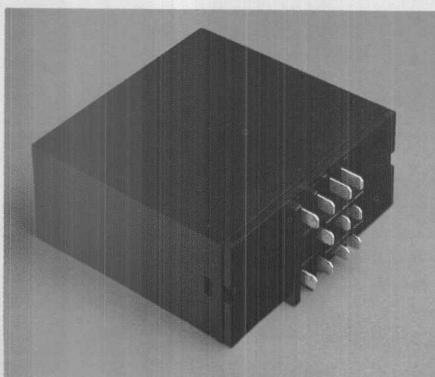
Type FXC



Type FXC 8332



Base (above), type D 411, for F-module, type FXD, with DIN-normed spade plug 4.8 mm (below).



TAVLE 2

TECHNICAL DATA

SUPPLY

AC supply voltage (pins a-b)

CHANNEL GENERATOR,
RECEIVERS with relay output
and TRANSMITTERS type FFD ... xxx:
Supply:
24, 120 or 220 VAC ± 10%.
45 to 65 Hz.
Consumption: FFD ... xxx:
2.5 VA, 0.5 W.
FAD 203 xxx:
2.5 VA, 2W.
Remaining types:
2.5 VA, 1.5 W.

DISPLAYS:

Supply:
24, 120 or 220 VAC ± 10%.
45 to 65 Hz.
Consumption: LCD-types:
2.5 VA - 1 W.
LED-types:
2.5 VA - 2 W.

DC supply voltage (pins 3-9)

CHANNEL GENERATOR:
10 to 30 VDC, < 80 mA.

TRANSMITTERS:

Type FFD: 10 to 30 VDC, ca. 10 mA.
Type FGD: Supplied through transmission cable.

RECEIVERS:

With relay output:
24 VDC, 1.5 W. (FAD 203 xxx: 2 W.)
With solid state output:
10 to 30 VDC, ca. 20 mA.

DISPLAYS:

Type FLC: 10 to 30 VDC, ca. 10 mA.
Type FKC: 12 VDC, 2 W.

Supply interruptions

The F-systems will not react to supply voltage interruptions of less than 2 cycles.

Voltage stabilization

The F-systems incorporate voltage stabilization.

Test voltage

2,000 VAC.
All F-systems for AC supply are equipped with built-in transformer for galvanically separating the electronic circuit and the supply voltage.

RELAY CONTACTS

RECEIVERS with output relay (SPDT):
AC: 300VAC-10A-2500VA,
resistive load.
DC: 250VDC-1A-250W or
25VDC-10A-250W.

RECEIVERS with output relay (SPDT)

types FCD 101, FCD 201:
AC: 300VAC- 5A-1250VA,
resistive load.
DC: 250VDC-0.4A-100W or
25VDC-4A-100W.

Mechanical life

30 mill. operations.

Electrical life

250,000 operations at max. load.

Test voltage

All output contacts are galvanically separated from the supply voltage and from the electronic circuit.
2,000 VAC.

Operational speed

Maximum 7,200 operations per hour.

AMBIENT TEMPERATURE

Type FXD:

Operating: -20 to + 50°C
(- 4 to +122°F)
Storage: -50 to + 85°C
(-58 to +185°F)

Type FXC:

Operating: 0 to + 50°C
(+32 to +122°F)
Storage: -20 to + 60°C
(- 4 to +140°F)

HOUSINGS

Type FXD: Black, NORYL SE 1.
Type FXC: Black, glassfilled NORYL.

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